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A new type of transporter with a new type of cellular function: L-lysine export from Corynebacterium glutamicum.

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We discovered that after deregulation of the L-lysine biosynthesis in Corynebacterium glutamicum, L-lysine accumulated in the cytosol and the efflux properties of this amino acid in mutants used for L-lysine production were altered. In this study we describe the cloning and molecular identification of lysE, which encodes the translocator specifically exporting L-lysine from the cell. The lysE gene product doe not display homology to any known transporter. It is only 236 amino acids in size, with the potential to span the membrane six times. The LysE protein was oversynthesized to confirm its deduced M(r) of 25425 Da. A probable regulatory gene, lysG, is localized immediately adjacent to lysE and displays all the typical structural features of an autoregulatory transcriptional regulator of the LysR-type family. L-Lysine export is correlated with lysE expression. A null mutant is unable to excrete L-lysine, whereas with overexpressed lysE, L-lysine is exported at a rate of 3.76 nmol min-1 mg-1 dry weight, which is five times the rate that was obtained with the wild type. A deletion mutant was constructed to search for a natural function of this unique carrier. Surprisingly, growth of this mutant is abolished on a salt medium in the presence of the dipeptide Lys-Ala. The quantification of the intracellular L-lysine concentrations revealed that, in response to peptide addition, there was an accumulation of the exceptionally high concentration of more than 1100 mM L-lysine. These results distinguish LysE as an

exporter, which: (i) structurally represents a new type of translocator; (ii demonstrates that exporters are also present for primary metabolites sucl as amino acids; and (iii) serves in one physiological function to link import with export activity.

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